Observations upon the Marine Barometer, made during the Examination of the Coasts of New Holland and New South Wales, in the Years 1801, 1802, *and* 1803. *By* Matthew Flinders, *Esq. Commander of His Majesty's Ship* Investigator. *In a Letter to the Right Hon. Sir* Joseph Banks, *Bart. K.B. P.R.S. &c. &c. &c.* Read March 27, 1806. [*Phil. Trans.* 1806, *p.* 239.]

The chief circumstance that induced Capt. Flinders to think his observations upon the marine barometer were worthy of attention, was the coincidence that took place between the rising and falling of the mercury, and the setting in of winds that blew from the sea and from off the land, to which there seemed to be at least as much reference as to the strength of the wind or the state of the atmosphere.

Our author's examination of the coasts of New Holland and the other parts of the Terra Australis, began at Cape Leuwen, and continued eastward along the south coast. His observations, which, on account of their length, we must pass over, show, that a change of wind from the northern half of the compass to any point in the southern half, caused the mercury to rise; and that a contrary change caused it to fall. Also, that the mercury stood considerably higher when the wind came from the south side of east and west, than when, in similar weather, it came from the north side.

Capt. Flinders now proceeds to relate the observations he made upon the east coast. From these it appears that the winds which came from between south and east caused the mercury to rise and stand high, as the same winds had done, with only one exception, on the south coast. The wind from north-east kept the mercury up above thirty inches on the east coast, and caused it to rise after all other winds, except those from the south-east; whereas, on the south coast, those winds caused the mercury to fall, and to stand much below thirty inches; owing, in our author's opinion, to the wind coming from off the land. During north-west winds, the mercury stood lower upon both coasts than at any other time; and, on both, those winds came from off the land.

Moderate winds from the south-westward, with fine weather, caused a descent of the mercury on the east coast; and during their continuance, it was much lower than with winds from the north-eastward; but upon the south coast it rose with south-west winds, and it stood much higher than with winds from the opposite quarter. But it must be observed, that the wind which blew from the sea upon one coast came from off the land on the other.

The mean height of the mercury on the east coast is stated by our author to be not less than 30·08 or 30·10 inches; whereas upon the south coast he estimates its mean height to be 30 inches. The greatest range observed upon the east coast was from 29·60 to 30·36; while upon the south coast the range was from 29·42 to 30·51. But it must be remarked, that these extremes are taken for very short intervals of time.

The observations made by our author upon the north coast are next detailed. The chief differences in the effects of winds upon this coast, from what they produced upon the south and east coast, are, that a north-east wind raised the mercury as high, if not higher, than one from the south-east; and that a north-west wind, when it came from off the sea, and was moderate, was equal, in the above effect, to either of them, and kept the mercury higher than the south-west wind did.

Upon considering the effects of the same winds upon the different coasts of Australia, as described in the foregoing summary of Capt. Flinders's observations, the following queries seem, he says, to present themselves:

Why do the winds from the north and north-west, which cause the mercury to descend and stand lower than any other upon the south and east coasts, and also in the open sea, and in the south-west bight of the Gulf of Carpentaria, make it rise upon the outer part of the north coast with the same or even worse weather?

Why should the north-east wind, which occasions a fall in the barometer, upon the south coast, considerably below the mean standard, be attended with a rise above the mean upon the east and north coasts? The south-east wind, upon the south and east coasts, causes the mercury to rise higher than any other;—why has it not the same effect upon the north coast and upon the west?

How is it that the south-west wind, which makes the mercury rise and stand high upon the south and west coasts, causes it to fall below the mean standard upon the east coast, and, with the same weather, to descend lower than any other upon the north coast?

The answer to these questions Capt. Flinders considers as sufficiently obvious; in support of which opinion he offers the following explanation:

The lower air, when brought in by a wind from the sea, meets with resistance in passing over the land; and to overcome this resistance, it is obliged to rise and make itself room by forcing the superincumbent air upwards. The first body of air which thus comes in from the sea, being itself obstructed in its velocity, will obstruct the second; and this will therefore rise over the first, in like manner, to overcome the obstruction: and as the course of the second body of air will be more direct towards the top of the highest land it has to surmount than the first was, so the first part of the second body will arrive at the top before the latter part of the first body has reached it; and this latter part will not be able to pass over the top, being kept down by the second body and the successive stream of air, whose velocity is superior to it. In this manner an eddy or body of compressed air will be formed, which at first will occupy all the space below a line drawn from the shore to the top of the highest land; but the succeeding bodies of air, at a distance from the shore, will soon feel the effect of the obstruction, and will begin to rise; by which the stratum of lower air will be deeper between the top of the land and the shore, and to some distance from it, than upon the

mountains or in the open sea. Hence it follows, that the mercury ought to stand somewhat higher when such a wind blows than with the same wind when it meets with no obstruction; and the more direct it blows upon the coast, and the higher the land is, the higher ought the mercury to rise. On the other hand, when the wind comes from off the hills, this dense air will be displaced; and thus the air over the coast will resume its natural state with a land wind.

Capt. Flinders concludes his paper with some general remarks upon the barometer, of which the following seem to be the most material:

It is not so much the absolute as the relative height of the mercury, and its state of rising and falling, that are to be attended to in forming a judgement of the weather.

In the open sea, the changes in the weather, and in the strength of the wind, appear to be the causes that chiefly affect the barometer; but, near the shore, a change in the direction of the wind seems to affect it as much, or more, than either of those causes taken singly.

On the open sea, also, the mercury seems to stand higher in a steady breeze of several days' continuance, provided it does not blow hard, than when the wind is variable. Perhaps it is on this account, as well as from the direction of the wind, that the mercury stands higher within the tropics than in those parallels where the winds are variable.

Upon the whole, our author thinks the barometer capable of affording so much assistance to the commander of a ship, that no commander in a long voyage should be without one.

Account of a Discovery of native Minium. In a Letter from James Smithson, *Esq. F.R.S. to the Right Hon. Sir* Joseph Banks, *K.B. P.R.S.* Read April 24, 1806. [*Phil. Trans.* 1806, *p.* 267.]

The minium here described by Mr. Smithson was found disseminated in a compact carbonate of zinc. Its general appearance was pulverulent; but when a lens was used, it showed, in some places, a flaky and crystalline texture. Its colour was the same as that of factitious minium: when gently heated by the blowpipe it became more obscure, but returned, upon cooling, to its original colour. By a stronger heat it melted into litharge; and, upon charcoal, was reduced to lead.

In dilute nitric acid it assumed a coffee-colour; and on the addition of a little sugar, this brown calx was dissolved, producing a colourless solution. Upon being put into muriatic acid, with a little leaf-gold, the gold was soon entirely dissolved.

When it was inclosed in a small bottle with muriatic acid, and a small piece of turnsole paper was fixed to the cork, the paper in a short time entirely lost its blue colour, and became white. Even a slip of common blue paper, whose colouring matter is indigo, when placed in the above situation, underwent the same change.

This native minium, Mr. Smithson says, seems to be produced by